FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 76 Thursday, June 14, 1945 No. 1504

One and a Half Million Castings

We are authoritatively informed that each temporary aluminium house such as is now on exhibition on a piece of ground laid waste by bombing at the rear of Selfridges' Oxford Street store will include about 30 castings. As the Ministry of Works has ordered 50,000 of these prefabricated bungalows, the foundry section will be called upon to supply 1,500,000 castings at the rate of 150,000 per month. Here is presented a first-rate opportunity for the light alloy foundry industry to employ mechanised production to the fullest extent. Moreover, there should be none of those vexatious delays due to inspection which was such an obvious and essential feature of aircraft manufacture.

We have been privileged to inspect the prototype house, and are sincere in offering to those responsible for its design our congratulations. The whole job has been sectionalised so as to permit factory construction and ease of transport to the building site. The bathroom and kitchen backing on to one another makes possible the concentration of the plumbing into one portable unit. It should not be imagined that the designers have allowed their obvious enthusiasm for aluminium to use it for unsuitable applications, and it can be stated that the utmost restraint has been used. No effort has been made to use light alloys for fixtures where the situation can best be designated as in "the experimental stage." Thus the fire grate, cooking stove, bath, refrigerator, wash bowls and sinks are of the conventional type, and are dictated no doubt by the availability of existing supplies. It will thus be appreciated that sections of the foundry industry, other than light alloy, will be called upon to play their part, and as orders for 50,000 of any component need much preparatory work, if they are to be produced with a maximum of economy, it is suggested that immediate steps be taken to line up all the Ministries, Controls, Directorates and actual manufacturers to ensure no choking of the production lines through lack of ancillary components.

It would be a service to the community if the Aluminium Development Association would supply a list of minimum requirements necessary for converting the house into a home, as it should be realised that many will be occupied by people who possess no household goods whatsoever. Could this be accompanied by a series of recommended suppliers? It would help the retailers in the districts where these houses are to be erected. The rapid rehousing of the population is now recognised by all parties as being a most urgent necessity, and the contribution which the aluminium industry can make is not merely "worth-while," but an essentially practical, economic and novel solution to a particularly "sticky" problem.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

568,883 UDY, M. J. Chromium recovery.

568,888 MOND NICKEL COMPANY, LIMITED. Alloy cast-iron rolls.

568,973 NORTHERN ALUMINIUM COMPANY, LIMITED, KING, F., and WARD, F. W. A. Melting pots and pouring ladles.

568,980 MCDONALD, J., and G.W.B. ELECTRIC FURNACES, LIMITED. Furnaces with circulation of internal atmosphere.

568,989 SUFFOLK IRON FOUNDRY (1920), LIMITED, and TIBBENHAM, L. J. Welding rods.

569,005 RADIO CORPORATION OF AMERICA. Heat-treatment of metals.

569,120 ARON, H. Electrical heating and forging of billets.

569,128 BAKER, G. Method of swaging shell forgings.

569,142 MCCARTHY, J. Foundry moulding machines.

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CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

THERMAL LAG

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—It is to be wondered if Mr. Brown's letter, published in your current issue, was incorrectly addressed, and Mr. Punch thereby deprived of a neat sample of satirical humour. However, I find two points which lend themselves to serious treatment.

No one will dispute that "heat follows fixed laws," but the mere statement will not put the heat where it is wanted. Considerable knowledge is still required to enable the principles of heat transmission to be satisfactorily applied. Those familiar with Groume-Grjimailo's work will appreciate the magnitude of the difficulties involved.

The suggestion that "malleable people overload the stoves, or try to get the work through in the minimum time" is an exaggerated distortion of efforts to obtain optimum throughput, and this latter should be the aim of all fuel consumers. Anything which contributes to an enlivened interest and an improved knowledge of heat transfer leads to greater efficiency. Fuel economy will continue to be of national importance, and whilst one can have economy without efficiency, one cannot have efficiency without economy.—Yours, etc.,

A. E. PEACE.

Ley's Malleable Castings Co., Ltd.,
Derby, England.
June 6, 1945.

INSTITUTE OF PHYSICS

The report for 1944 of the Institute of Physics shows that membership increased by some 15 per cent.—a new record. Despite wartime difficulties the groups and the branches both at home and overseas held meetings and conferences covering a wide range of technical and professional subjects. A new and successful venture was the publication of a series of lectures given before the Industrial Radiology Group as a "Handbook of Industrial Radiology." The "Report on the Teaching of Mathematics to Physicists," prepared jointly with the Mathematical Association, was published during the year and was well received. Arrangements with the Ministry of Education for the establishment of national certificates in applied physics were completed by the setting up of a joint committee to administer the scheme agreed. Fifteen candidates were examined for the Institute's Laboratory Arts Certificate.

At the annual general meeting of the Institute, held on June 4, the following were elected to take office on October 1, 1945:—President, Sir Frank Smith; vice-president, Prof. A. M. Tyndall; hon. treasurer, Major C. E. S. Phillips; hon. secretary, Prof. J. A. Crowther; ordinary members of the board, Dr. B. P. Dudding, Mr. A. J. Maddock, Prof. W. Sucksmith and Dr. C. Sykes. Prof. C. T. R. Wilson, F.R.S., was elected an Honorary Fellow of the Institute.

BRITISH FOUNDRY SCHOOL

At a meeting of the governing body of the British Foundry School, held recently in London and attended by representatives of trade associations, research associations, scientific and professional institutions, technical and education committees, the Ministry of Education and firms connected with the industry—cast iron, steel, non-ferrous alloys, including aluminium, magnesium, bronze and brass founders—it was unanimously agreed to reopen the British Foundry School as soon as possible.

For the past two or three years there has been a steadily increasing demand that the British Foundry School should reopen. The governing body was unanimous in its decision to meet this demand at the earliest possible date. The necessity for the school in educating the foundry industry to a higher degree of efficiency, and in the creation of superior grade personnel, thus making the industry more attractive to labour, was stressed by one member. Birmingham is regarded as the most suitable centre, and the meeting felt the school should be associated with an educational institution.

In its pre-war existence the school had had no failures; many ex-students are now occupying executive posts of considerable importance in the industry. It was confidently anticipated that ex-students would—in the light of their experience at the school—not hesitate to recommend as students those likely to profit by the course of instruction given. A committee of five members was appointed to consider ways and means of starting the school. The committee will deal with such matters as finance, students, accommodation, staff, etc., and will report with all speed to the governing body, which will itself require modification following changes in the industry during the war.

FACTORS INFLUENCING STEEL DEMAND

The United States Steel Corporation plans to spend $50 million on post-war improvements at its Gary plant, according to MR. IRVING S. OLDS, chairman of the board, addressing a recent meeting of Gary Chamber of Commerce. Referring to the great increase in the steel-making capacity of the United States, and emphasising that demand for steel dictated its production, the speaker said: "The steel industry of itself cannot create an overall demand for its products and thus maintain its plants in reasonably full operation. That demand is dependent upon general business conditions, and in the main is beyond the control of the steel producers. Customers are in the market for steel in large tonnages only when they can put their steel purchases to a profitable use. We can all help by exerting our influence toward the adoption of sound constructive national policies, such as a tax system which does not penalise and hinder industrial progress, and a labour programme which is equally fair to both employer and employee, and which recognises and keeps their respective rights and obligations in our economic order."

CONSISTENCY AND THE CUPOLA

An outline of factors affecting the control of cupola melting

By C. A. PAYNE

(*Continued from page* 117.)

Blast Control

Air is the other component of the combustion reactions, as it is the vehicle for the supply of oxygen. If the only source of oxygen were the compressed gas cylinder, then it is certain that economic considerations alone would guarantee that the principles of combustion would be more generally appreciated in the foundry. The percentage of oxygen in the atmosphere is, for all practical purposes, a constant. As it is a given weight of carbon that is to be consumed to melt a certain weight of metal, then it is necessary to supply a given weight of oxygen for the burning. The amount of coke to be burnt controls the amount of air to be supplied. This amount of air must be measured.

The usual measuring apparatus utilises the pressure of flow in the blast main, and the readings given are generally of volume. This introduces a complication for the weight of air per unit volume is by no means constant. The density of the gas changes with two factors, the atmospheric pressure and the temperature. Increasing pressure, as shown by an increase in barometer reading, increases the density, and less volume of air is required to give a desired weight. Increasing temperature leads to expansion with resultant decrease in density, or increase in volume, to give the same weight of air. Thus, before the air requirements can be adequately stated, it is necessary to know the atmospheric conditions, and in order to measure these requirements, an accurate and reliable gauge must be used. This accuracy and reliability is as much a function of the location of the measuring points as of the fitting of the instruments.

The cheapest, easiest to instal, and in many opinions, under controlled conditions, the most reliable means of measuring is by the Pitot tube. The orifice plate is more difficult a case for it requires a flanged joint at which the disc can be fitted. The Venturi tube is a pipe of very special change in diameter, and, with existing blast mains, requires the cutting out of a length of the main to fit it. Whichever be adopted, it is essential that it be fitted in a straight length of constant diameter main, the minimum length being eight times the diameter of the main. This is to minimise the influence of turbulence, a factor too often responsible for unreliable values. Again, even though the instrument be regarded as suitably installed, some means of checking is desirable, and the standard method is by use of an accurately calibrated Pitot tube and differential manometer.

The reason for stressing the need of accurate instruments is that once the cupola is charged up, and the blower is on, then the air supply is the most potent control factor available. Assuming that the fuel, flux and metal charges have been correctly measured and charged, the adjustments to the air supply will give the desired results—if the gauge readings are reliable.

The determining factor of the air weight required is the completeness or otherwise of normal combustion. Complete burning of the carbon to carbon dioxide yields the maximum possible quantity of heat (14,550 B.Th.U's per lb. of carbon). In this case, each pound of carbon requires 2.66 lb. of oxygen. If all the carbon be converted to the monoxide, then the heat produced is very much less (4,350 B.Th.U's per lb.) and the weight of oxygen used is half that for producing CO_2. Another reaction occurs when CO_2 is in contact with incandescent carbon, resulting in the formation of CO, with a consequent heat absorption to the extent of 5,859 B.Th.U's per lb. of carbon.

The ideal is naturally the supply of sufficient air to give 100 per cent. CO_2; this is, however, accompanied by a subsequent absorption of heat, due to the reaction between the incandescent coke and this CO_2. Any tendency in practice to diverge from conditions approaching efficient combustion is obviously a drift away from control. The particular tendency, so easily allowed and so difficult to combat, is the desire to increase the coke by "just another forkful," because the cupola is melting cold, or running not quite to schedule. From the quick consideration of the figures above, it is very evident that, if the correct quantities of coke and oxygen are being supplied, then the temperature is a matter of the weight of metal relative to the coke charge. The most unfortunate features of this "little extra coke" are that rarely do instructions say exactly what extra weight, by how much is the blast volume to be increased, and when the additional coke supply is to be stopped. That it is stopped is probably due to an inherent, and natural, dislike on the part of the operator, to charging any increased weight of material into the furnace, and an equally natural desire to leave some room in the cupola for metal charges.

Coke Weight and Air Supply

The coke weight and air supply must be balanced, so that efficient combustion is obtained in the required time to achieve the necessary coke-burning rate. This time factor is settled by the thickness of the coke charge layer, and the speed of the chemical reactions. From theoretical and practical considerations, a certain narrow range of velocity is desirable, and marked deviations from this range upset the balance of conditions.

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This velocity, as indicated by the windbelt pressure, also governs the bed height. To start with, the bed below the tuyeres does not enter the matter, except in so far as it burns away in the initial stages, causing some settling down of the coke above it. From the tuyeres to some 18 to 30 in. above are the zones of complete removal of oxygen and of maximum temperature. The actual depth of these zones is affected by, and is roughly proportional to the square root of, the windbelt pressure. Above this a layer of coke equivalent to that burnt in melting one charge, and then a "safety layer," to compensate for the settling of the bed, and ensuring that the solid metal charges are kept above the zone of free oxygen.

The moisture content of coke and blast is too often ignored, apart from any consideration given to the effect upon the measurements of the materials. In the case of coke it is usually assumed that the heat of the waste gases will dry it. To vaporise 1 lb. of moisture and to heat it to 450 deg. C. requires approximately 1,200 B.Th.U's. One pound of coke (90 per

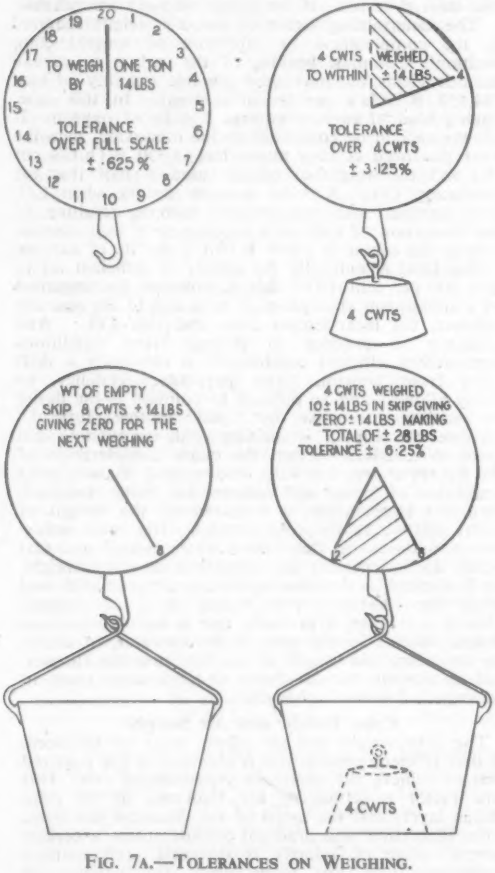
TO WEIGH BY ONE TON 14 LBS
TOLERANCE OVER FULL SCALE ± ·625 %
4 CWTS TO WITHIN WEIGHED ± 14 LBS
TOLERANCE OVER 4 CWTS ± 3·125%
4 CWTS
WT OF EMPTY SKIP 8 CWTS ± 14 LBS GIVING ZERO FOR THE NEXT WEIGHING
4 CWTS WEIGHED 10 ± 14 LBS IN SKIP GIVING ZERO ± 14 LBS MAKING TOTAL OF ± 28 LBS TOLERANCE ± 0·25%
4 CWTS

FIG. 7A.—TOLERANCES ON WEIGHING.

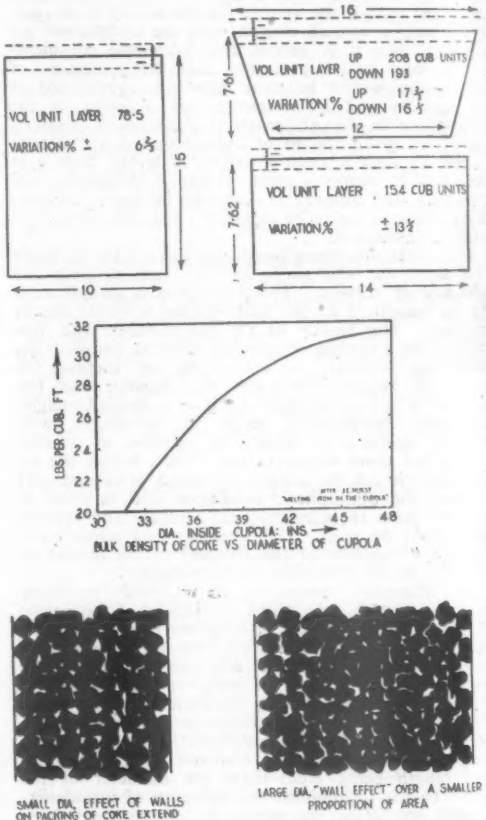

FIG. 7B.—MEASUREMENT BY VOLUME VARIATION OF VOLUME DUE TO VARIATIONS OF LEVELLING. APPROX. VOL., 1,180 CUB. UNITS. VARIATION IN HEIGHT ± 1 UNIT.

cent. fixed carbon) will generate up to 13,100 B.Th.U's, or roughly 1 lb. of coke is required to eliminate 10 lb. of moisture. In the case of the blast, it is not a matter of drying, for the moisture reacts with the incandescent coke to form CO_2 and H_2, with a subsequent heat loss. One pound of moisture in the blast requires approximately 1¼ lb. of coke to compensate for the heat loss. This coke requires extra blast to maintain the standardised combustion conditions.

The slag, in normal foundry practice, is regarded solely as a means of separating charged sand, rust and coke ash from the metal. In steel melting, slag control is part of the melting process. The recent report on the basic-lined cupola indicates that cupola slags may yet come to be a control factor, not just a necessary evil. Present cupola melting is an "acid" process, and limestone the usual flux. Limestone should be checked for the available SaO (the fluxing reagent), and the "self-slagging" impurities, mainly silica, iron oxide and alumina. The weight of limestone is sometimes computed on the basis of the coke charge (25 to 30 per cent.) and sometimes on the basis of the metal charge (2 to 4 per cent.).

Charging Practice

Charging practice commences with the accurate and consistent measurement of the charge materials. The degree of accuracy required is set by the type of mix, raw materials, the size and weight of the charge. The method of measuring determines the degree of accuracy obtainable, quite apart from the influence of the human element. The influence of the weighing machine on accuracy and tolerances allowed is important. The tolerances to be placed on weighing depend upon the quantity to be weighed, the smallest weight that will be shown by the machine, and the relative weights of charge and container, when the latter is used. Obviously, if a charge constituent (*e.g.*, ferro-alloy) forms a very small proportion of the charge, but its effect is great, due to its composition, then this must be weighed on a separate and more sensitive instrument to obtain results of any value.

The tolerances of measurement by volume, with particular reference to coke weighing, are also important. The main point to be emphasised here is the relationship between the size of pieces to be measured, the diameter and depth of the container. Charging is not just a matter of tipping in and filling up. Level charging with a complete layer of coke between charges, and a constant rate of supply, *i.e.*, keeping the stock up to the level of the sill, not piling it up to allow for a 10-minute spell whilst the burden sinks some 2 ft. or so, and placing the materials according to size and melting point—these are the hall-marks of good charging practice.

Level charging is more than ever necessary when running more than one type of mix through the same cupola, to avoid charge dilution, and when utilising alloy materials in the charge. If all is done to ensure regular descent of the material down to the melting zone, then there is a greater opportunity for separation

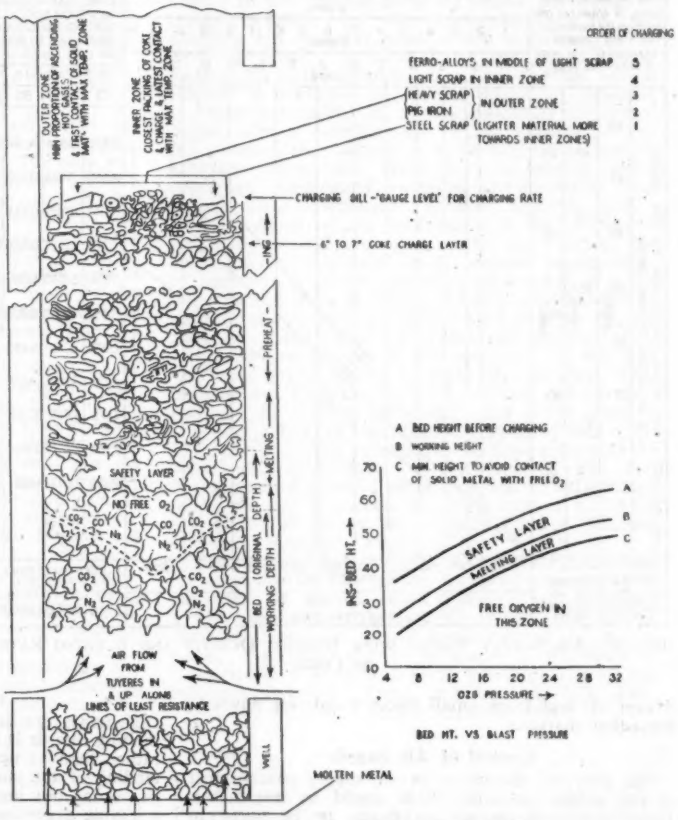
ORDER OF CHARGING
FERRO-ALLOYS IN MIDDLE OF LIGHT SCRAP 5
LIGHT SCRAP IN INNER ZONE 4
HEAVY SCRAP
PIG IRON
IN OUTER ZONE 3 2
STEEL SCRAP (LIGHTER MATERIAL MORE TOWARDS INNER ZONES) 1
OUTER ZONE
MIN PROPORTION OF ASCENDING & FIRST CONTACT OF SOLID MAT'L WITH MAX TEMP. ZONE
INNER ZONE
CLOSEST PACKING OF COKE & CHARGE & LATEST CONTACT WITH MAX TEMP. ZONE
CHARGING SILL - "GAUGE LEVEL" FOR CHARGING RATE
6" TO 7" COKE CHARGE LAYER
PREHEAT
MELTING
SAFETY LAYER
NO FREE O_2
BED (ORIGINAL DEPTH)
WORKING DEPTH
AIR FLOW FROM TUYERES IN & UP ALONG LINES OF LEAST RESISTANCE
WELL
MOLTEN METAL
A BED HEIGHT BEFORE CHARGING
B WORKING HEIGHT
C MIN HEIGHT TO AVOID CONTACT OF SOLID METAL WITH FREE O_2
INS. BED HT.
70
60
50
40
30
20
10
SAFETY LAYER
MELTING LAYER
FREE OXYGEN IN THIS ZONE
4 8 12 16 20 24 28 32
OZS PRESSURE →
BED HT. VS BLAST PRESSURE

FIG. 8.—BED HEIGHT AND CHARGING METHOD.

The molten metal from various constituents collects in the spaces between the coke filling the well. Little diffusion can occur, therefore mixing of the constituents is not adequate until intimate mixing in ladle or forehearth, free from partially burnt and slag-contaminated coke.

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of successive charges (*e.g.*, by extra coke "splits" to give a slight delay in melting), and less opportunity for relatively small pieces of high alloy material wandering from one charge to the next. This alloy addition, whether as straight ferro-alloy, or in briquette form, must be placed on top of, or in the scrap at the very centre of the stack. One of the advantages of using low grade ferro-alloys (*e.g.*, 10-15 per cent. silvery pig or 15-18 per cent. manganese spiegeleisen) is that bigger pieces can be used, and there is less danger of, and from, small pieces wandering down to preceding charges.

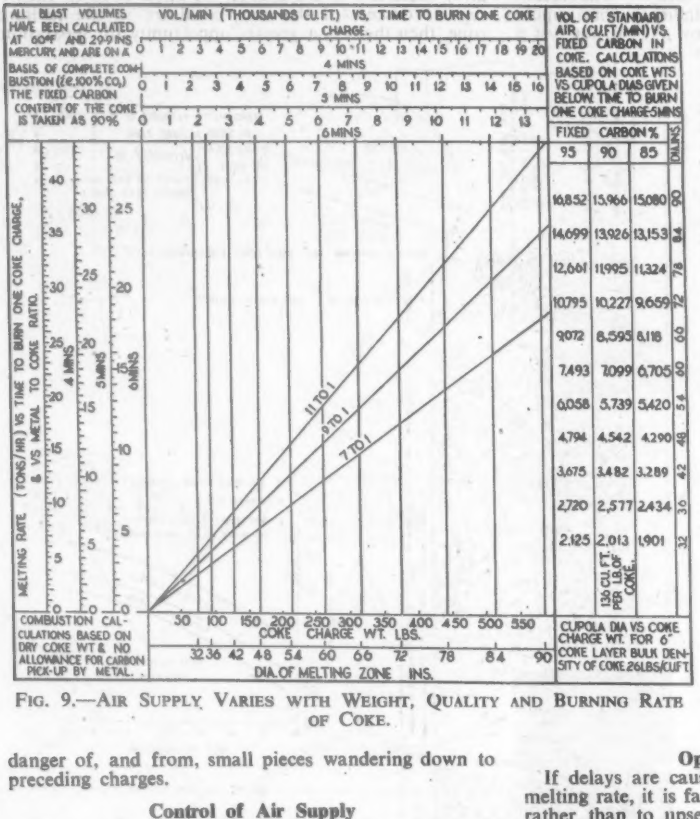
ALL BLAST VOLUMES HAVE BEEN CALCULATED AT 60°F AND 29·9 INS MERCURY, AND ARE ON A
VOL./MIN (THOUSANDS CU.FT.) VS. TIME TO BURN ONE COKE CHARGE.
BASIS OF COMPLETE COMBUSTION (i.e.100% CO2) THE FIXED CARBON CONTENT OF THE COKE IS TAKEN AS 90%
4 MINS
3 MINS
6 MINS
MELTING RATE (TONS/HR.) VS TIME TO BURN ONE COKE CHARGE, & VS METAL TO COKE RATIO.
11 TO 1
9 TO 1
7 TO 1
COMBUSTION CALCULATIONS BASED ON DRY COKE WT & NO ALLOWANCE FOR CARBON PICK-UP BY METAL.
COKE CHARGE WT. LBS.
DIA. OF MELTING ZONE INS.
VOL OF STANDARD AIR (CU.FT/MIN) VS. FIXED CARBON IN COKE. CALCULATIONS BASED ON COKE WTS VS CUPOLA DIAS GIVEN BELOW. TIME TO BURN ONE COKE CHARGE-5 MINS
FIXED CARBON %
95 90 85
10,852 13,966 15,080
14,699 13,926 13,153
12,661 11,995 11,324
10,795 10,227 9,659
9,072 8,595 8,118
7,493 7,099 6,705
6,058 5,739 5,420
4,794 4,542 4,290
3,675 3,482 3,289
2,720 2,577 2,434
2,125 2,013 1,901
136 CU FT. PER LB. OF COKE.
CUPOLA DIA VS COKE CHARGE WT. FOR 6" COKE LAYER BULK DENSITY OF COKE 26 LBS/CU.FT.

FIG. 9.—AIR SUPPLY VARIES WITH WEIGHT, QUALITY AND BURNING RATE OF COKE.

Control of Air Supply

The previous discussion of air supply covers most of the points concerned with regard to this factor. There are, however, certain things to be borne in mind during the blow. First, when starting up, the blast volume should be that standardised for the run, so that the bed conditions can be quickly stabilised. At the end of the melt, with the decreased resistance of the stock, a close control is needed to avoid over-blowing, an actual reduction in the volume from the standard being made only during the melting of the last two charges or so. Both pressure and volume readings are the guides in this respect. During the run, variations in volume must be avoided. Too great a supply means more rapid consumption of the bed and a lowering of the level of solid metal until, with prolonged over-blowing, free oxygen is in contact with this metal giving excessive oxidation and its attendant troubles. Too low a volume, or too low a blast pressure, results in a gradual building up of the bed, because the coke is not being consumed at the required height and rate. Slow melting, with an ultimate falling off in temperature are the symptoms of this trouble.

The responsibility for the manipulation of the blast control should be placed upon a definite person, preferably one not connected with the manual operation of the cupola. Where metallurgical control at the spout is carried out, then the control operator is the obvious choice. In cases where this does not happen, then the foreman responsible for the melting should supervise, if he does not himself carry out the actual control. In this connection it is pertinent to refer to planning of metal distribution. Every endeavour should be made to facilitate the routing of the metal through the foundry, so that the destination of every ladle is known before it is tapped, and the smooth working of the cupola is not interrupted, to cope with some special job, or by delay caused by ladles failing to return, or to be available for tapping. Like many other items, this is a simple and obvious point affecting the rate of tapping, which should be closely synchronised with the steady rate of melting, this in turn allowing a steady rate of charging.

Operational Details

If delays are caused that require a reduction in the melting rate, it is far better to stop the blower entirely rather than to upset the balance of conditions. The tending of the cupola is a highly skilled job, often to be carried out under uncomfortable conditions. Considerable experience is required, but many of the little things of the job collectively can make or mar a run. The job is, or should be, concerned with three main items, tapping, tuyeres and slagging.

A well laid taphole, well dried, and protected from

direct contact with the first few drops of cold slag and iron, by a screen of selected pieces of coke, is the foundation of good tapping practice. With continuous tapping the job is simplified, more particularly with a front slagging spout. Intermittent tapping requires an adequate supply of clay with just sufficient moisture to give the required plasticity, and worked or kneaded to give uniformity, three rods, upended for the clay bot, and at least two firm, sharp tapping rods, and a hammer and block for keeping the bars in trim. It is universally agreed that if a hard hole should occur, with good practice, very rarely, then an oxygen lance be used to open up the taphole. In many cases the availability of the necessary oxygen cylinder and iron tube is a matter of time in finding, collecting and bringing them to the taphole. As a result, the tender often takes a chance with the hammer and bar, with an end of the standardised taphole, at the least, or the end of the taphole brick and safe operation at the spout, at the worst.

Care in Poking

The tuyeres, in ideal practice, would never get slagged up, the bed never burn hollow or burn away, and the covers need never be opened. The only way of approaching that ideal is by the judicious use of a suitable bar to prise away the first signs of slag curtain, and to work the coke into a consistent and uniform pack. Once again, a hammer is needed, not to drive the bar straight through the cupola, but to keep the bar in condition. It is sometimes argued the poking leads to unnecessary air losses whilst carrying it out. Starting soon enough, and with care rather than vigour, will ensure minimum losses by keeping maximum cleanliness.

Slag or cold iron in the tuyeres is a sure sign of bad timing, either in getting the metal away from the furnace, or in running off the slag, this latter in the case of intermittent tapping or with a syphon brick. Slagging out requires to be done to a definite, consistent plan as much as does tapping out. In the initial stages of the blow, all the ash from the preliminary fire and the bed, as well as the impurities in the charge, have to be removed. This slag, particularly if an extra provision of limestone for the bed coke be not made, sometimes tends to be stickier and more troublesome to remove. To avoid this a frequent happening is the delay in slagging out until there is "something to get out" which usually means until the required tap weight cannot be obtained without slag at the taphole.

The later slag is influenced in composition and properties by the fact that melting losses from the metal charge increase slightly as bed conditions settle down, the relative proportion of coke ash is decreased to that due to the charge coke only, and the wear on the lining becomes more pronounced. With the first slag removed in good time, say, in the first hour of blowing, and subsequent slagging done hourly, then marked changes in the composition of these hourly slags are indications of changes in the melting conditions. It is not sufficient to slag out once an hour, for slag removal must be synchronised with the rates of melting and tapping, with due regard to the amount of metal in the well. Too full a well leads to wastage of molten metal, together with a probability of clogging the tuyeres, when the blast is reduced or shut off to allow the slag hole to be opened. With the well too empty the losses are of time, of air and of balanced conditions due to this loss of air.

Timing of Operations

The timing of these operations, their synchronising with the melting of the furnace and the requirements of the foundry are all too frequently guessed. The cost of a clock, in such a position that it can be used for this purpose, is a small item in comparison with a wastage of time, effort and, not infrequently, metal itself. In this respect, as in all others pertaining to cupola practice, the why and wherefore of the schedule will probably need careful explaining to the men concerned. Ingrained habit and rule-of-thumb methods cannot be changed in a day, and the human element is probably the biggest factor in obtaining satisfactory control. If a new procedure be introduced, with a pointing out of the reasons for its introduction, then success is more likely than just by arbitrary instructions. Even so, repeating an earlier statement, standardised conditions and procedure must be maintained by competent control and supervision.

Measurement of the uniformity of the product is frequently carried out by tests on the iron at the spout. Whilst this check on the success, or otherwise, of operation is essential to complete control, it is not the complete thing in itself. As with all other checking carried out, the value of the work depends entirely upon the utilisation of the results, and the making of comprehensive records is not the sole end of such observations that should be taken of each melt. That progress has been made in the melting and development of the modern cast iron is due to the keeping, and interpreting, of records. The progress that is yet to be made cannot be achieved without such aid. In conclusion, it remains to be pointed out that irrespective of type of plant, equipment and product made, the key to success in cupola control is, in the title words of Dr. W. H. Gillett's Edward Williams Lecture, "Foundry Teamwork."

There now remains only the acknowledgment of and the rendering of thanks for the encouragement and assistance of friends and colleagues at Qualcast, Limited, particularly in the criticism and correction of the rough copy, and in the preparation in the lantern slides. Reference should be made to the work of J. E. Hurst ("Melting Iron in the Cupola"), Campbell and Grennan (Trans. A.F.A., Vol. VII, Feb., 1936), and John W. Bolton ("Gray Cast Iron").

"600," THE HOUSE ORGAN of George Cohen, Sons & Company, Limited, in No. 95 of Vol. 19, just issued, recaptures much of the spirit of pre-war days. It combines news of the personnel of the "600" group with a few serious articles and much excellent wit. The illustrations are—just as they always were—screamingly funny.

MEEHANITE RESEARCH INSTITUTE

ANNUAL MEETING IN LONDON

The thirteenth annual meeting of the Meehanite Research Institute was held at Grosvenor House, Park Lane, London, W., on May 30 to June 1, when a large attendance of members, representative of the British licensees, shared in the discussion of many matters appertaining to the Meehanite process. It had been confidently expected that, consequent upon the cessation of hostilities in Europe, Mr. Oliver Smalley, O.B.E., the chairman, would have been present, but, unfortunately, it was not possible for him to arrive in this country in time, so Mr. N. E. Rambush, the vice-chairman, again presided. He was supported by the directors of the Institute and the staff of International Meehanite Metal Company, Limited, at the opening session of the conference.

The first day was occupied with meetings of the board of directors of the Institute, and the Sub-Committees for Research and for Education. The chairman (Mr. Rambush), in opening the general meeting, reported that at the meeting of the board Mr. Oliver Smalley had been re-elected chairman and Mr. R. B. Templeton re-elected secretary. Vacancies on the board had been filled by the election of Mr. W. H. Richards and Mr. L. Gould. He further announced that the increased subscription decided upon for last year would be continued for the current year. He reminded members that the Institute was their own Institute and was for the purpose of furthering research in connection with the Meehanite process and for the advancement of the foundry industry. Research was essential and anyone who did not carry out research could not hope to advance. He at times had doubts whether some foundrymen knew what research was. He devoted 20 per cent. of his own profits to research and knew the benefits derived; those who did not do any research or thought that they could not do it, were, in his view, wrong. He had decided that his own main work for the Institute this year would be the encouragement of more research work by the members, and he would arrange for help to any who needed it.

The reports of the secretary and treasurer were presented and adopted.

Work in Hand

The report of the Sub-Committee on Research, presented by Mr. J. E. O. Little, showed that a considerable amount of work is in hand, eight reports of work completed during the year were submitted for discussion and nine researches were in progress. It was stated that much consideration had been given to intensifying the research effort and getting a greater amount of work completed. In future quarterly reports on work in progress will be circulated to all members of the Institute. It was announced that Mr. G. B. Taylor had been elected chairman and Mr. F. Buckley vice-chairman.

The Education Sub-Committee report, presented by Mr. W. H. Richards, detailed a scheme for attracting apprentices to the foundry and a system of training them in foundry practice, together with a system of instruction within the Meehanite group in the special technique required in Meehanite working. The report led to a full discussion before the committee was directed to continue to explore methods for putting the scheme into working form.

The meeting then proceeded to the discussion of some 30 technical Papers and reports dealing with a variety of subjects appertaining to Meehanite production and general foundry matters.

Reports Submitted

As usual the reports dealing with details of manufacture and the service records of castings produced by licensees in Britain, the United States, Australia, Canada, New Zealand, South Africa and other countries aroused much interest. Other reports dealt with the Manufacture of Grain Rolls; Planned Production in the Foundry; Behaviour of the Coke Charge in the Cupola; Heat Resistance of Various Meehanites; Tensile Strength in Castings; Study of Hardness and Methods of Testing; Temperature and Fluidity of Molten Meehanite Metal; the Use of Feeder Core Risers; Insulation of Risers; Specific Gravity of Meehanite; Structural Changes of Meehanite at Elevated Temperatures; Cupola Wind Box Pressures; Creep Properties of Meehanite; Torsion Properties of Solid and Hollow Bars of Meehanite; and Various Aspects of Heat-treatment of Meehanite.

The second day of the conference, as previously reported, concluded with the annual dinner, the first since 1939, when the principal guests were:—Mr. J. W. Gardom, president of the Institute of British Foundrymen; Mr. E. A. Chell, late of the Ministry of Supply, Iron Castings Control; and Mr. V. C. Faulkner, Editor of THE FOUNDRY TRADE JOURNAL. During this function greetings were sent to Mr. O. Smalley, chairman of the Institute, and to Mr. J. Cameron, who was prevented from attending on account of illness.

The concluding day of the conference was devoted to further discussion of technical reports, meetings of the Sub-Committees on Advertising and Publicity (chairman, Mr. W. H. Harper) and Merchandising (chairman, Mr. N. E. Rambush).

During the afternoon of June 1 a large party of the members accepted the invitation of the directors of the Ealing Park Foundry Company, Limited, to visit their works.

HEAVY DUTY STEEL SPRINGS have been used for isolating furnaces from vibration with the object of prolonging roof and arch life.

A PAMPHLET ENTITLED "Hardening and Tempering High-speed Steel," received from the Controller of Jigs, Tools and Gauges, Machine Tool Control, 35, Old Queen Street, London, S.W.1, after wasting a whole page on a rather silly cartoon, thereafter gives an excellent practical description of the method to be employed for hardening and tempering high-speed tools. It is available to our readers on writing to the Control.

DESIGN AND TESTING OF SPACE HEATERS*

Heating, cooking and hot-water services from a single solid-fuel fire

By J. S. HALES, B.Sc., A.Inst.P.

Before considering the question of types of appliances for domestic heating, it is desirable first to take into account the factors which contribute to comfort heating in living rooms. It is, of course, common experience that one senses the different degrees of comfort in rooms and classifies them as—comfortable or uncomfortable, stuffy or chilly, dry or draughty.

A considerable amount of physiological work has been carried out in this country and abroad in an attempt to distinguish between the effects observed and relate them in some way to air temperatures, type of radiation, etc. These experiments confirm that one's sense of comfort depend upon five main variables, *viz.*: (1) air movement in the room; (2) type, direction and amount of radiant heat; (3) air temperature, including the temperature gradients from floor to ceiling; (4) wall temperatures; and (5) relative humidity of the atmosphere.

The best combination of these factors giving a maximum degree of comfort vary naturally with the individual, and even more from one country to another; for example, in America there is a general preference for a low air movement with high air temperature, whilst in Great Britain the general opinion is that the optimum sense of comfort is obtained by a combination of conditions which provide a room which is as cool as is compatible with comfort (say, 55 to 60 deg. F.), with adequate air movement, with the average wall and surrounding temperatures preferably higher than the air temperature, and the air at head level not appreciably warmer than the air at ankle level.

Air Movement

In considering each of these variables, it may be noted that if the air and wall temperatures of a room are too low, it cannot be fully compensated merely by an increase in radiation directed to one side of the body. Also if there is a big difference between the ceiling and floor temperatures there is a general feeling of discomfort or stuffiness. With regard to air movement it is obvious that direct draught should be avoided, although as already indicated a certain amount of air movement is desirable.

Wall and surrounding temperatures are of great importance, and it is interesting to note that it is often difficult to distinguish between the effects of cold walls and direct cold draughts. Visual radiation is also of very great importance, and this concerns not only the amount and direction of radiation, but also its quality, that is, for example, whether it comes from a high or low temperature source. Although only a limited amount of work has been done on the question of type or quality of radiant heat it is generally agreed that the shorter infra-red rays are more pleasant and stimulating than the longer wavelengths associated with the low-temperature sources; for example, the type of radiation from an open fire is generally agreed to be more comfortable than the radiation from, say, a hot-water radiator.

FIG. 1.—A NEW TYPE OF CONTINUOUS BURNING SPACE HEATER, SHOWING CLOSURE FIRE COVER IN DOWN POSITION.

The question now arises as to whether such ideal conditions as have been indicated above can be achieved by any practical forms of appliance, and it is as well,

* A Paper read before the Falkirk section of the Scottish branch of the Institute of British Foundrymen.

Design and Testing

therefore, first to consider how far the existing types of units already fulfil these requirements.

The Open Fire Grate

First there is, of course, the open fire which depends for its heating almost entirely on direct radiation. It is generally conceded that radiation from the open fire

FIG. 2.—TEST SET-UP FOR MEASUREMENT OF RADIATION, CONVECTION, SMOKE EMISSION, ETC.

is pleasant, especially when the fuel burnt is bituminous coal. The ordinary open fire suffers, however, from the disadvantage that the zone of comfort is restricted to a fairly small area around the fire, and being an intermittent appliance, very often the surrounding walls and air temperatures are far too low to give comfortable heating conditions. Moreover, the amount of air drawn through the room on the way to the flue is usually excessive, and produces uncomfortable floor draughts. Some of these defects can be reduced with improved open fires giving hot air heating in addition to radiation, as the air temperature is thereby increased more generally in the room thus giving less restricted zones of comfort.

The open-close stove is another appliance which provides both hot air and radiation heating, but differs from the improved open fire in that the proportion of convection to radiation heating is much greater for the open-close stove. The further advantage that this type of appliance has is that it is normally operated continuously and thereby ensures that the room and wall temperatures are kept at a reasonable level; it should be noted that open fires can be fitted with suitable fire closures to provide a continuous night and day fire; a unit of this type is illustrated in Fig. 1. Moreover, with the open-close stove flow of air through the room is reduced when used as an open fire. It should be pointed out, however, that, as normally designed, the amount of ventilation is seriously reduced when the fire doors are closed and there is a tendency under these conditions for the room to become " stuffy."

Thermal Efficiency

Although the thermal efficiency of the fully closed stove is even higher than that of the open-close stove, it is less suitable for living rooms than the other types owing to the comparatively small proportion of radiant heating and tendency for the atmosphere to be " stuffy," which, as already indicated, may be due to a lack of air movement and ventilation, together with a rather large difference between air temperatures at the floor and ceiling.

Although so far remarks have been confined to solid fuel, a very brief reference may be made to other fuels, such as gas and electricity. It will be obvious from the remarks already made that for living rooms, an intermittent fire cannot be as comfortable as a continuous-burning fire, since in the former case wall temperatures are invariably too low, and the sensations of dryness experienced in some cases with these fuels may often be due to a combination of the type of radiation emitted, high temperature gradients and low wall temperatures.

Desirable Characteristics

It will be seen that characteristics required of a space heater to give the maximum comfort are broadly as follow:—(1) The unit should give a large proportion of high-temperature radiation, preferably of a variable and stimulating type such as obtainable from an open fire; (2) the unit should be continuous burning to ensure the room walls and surroundings do not cool down too much when the room is used only intermittently; (3) there should be as great a reduction as is possible of through room drafts, although air movement and ventilation should remain adequate; and (4) the unit should provide a proportion of hot air or convection to ensure reasonable air temperature which would extend the comfort zone around the unit.

In addition, the following features are desirable,

although these are not directly associated with comfort; thus, the unit should be:—(5) Thermally efficient; (6) easily controllable; (7) capable of burning a wide range of fuel and reduce the smoke emission when using bituminous coal; and (8) require a minimum of attention for ash removal and refuelling.

Such a combination of characteristics would, for example, be given by an unstricted open fire of good appearance, emitting a large proportion of high-temperature radiation, but at the same time providing a proportion of hot-air heating to the room, such a fire to be provided with either a closure lid or closure doors to provide safe and effective continuous burning with a low fuel consumption overnight. Provision for the reduction of smoke emission could be provided, and this might take the form of designs incorporating correct insulation of the firebox, continuous burning to maintain the firebox temperature, and addition of preheated secondary air to mix with the volatiles emitted from the top of the fuel bed. To provide for the infrequent removal of ash at not more than weekly intervals, a suitable design of ash-pit or dump could be incorporated. For the reason of easy installation, the unit should be as self-contained as possible with all important parts, such as the fire throat, incorporated in the appliance.

Testing of Space Heater

There are two main methods of testing space heaters; first, from the point of view of the degree of comfort heating and, secondly, in the terms of heat emission and efficiency as a space heater. The first method obviously involves conditions other than the appliance, *e.g.*, the size, construction and shape of the room in which the test is made, atmospheric conditions, and also type of apparatus used for the test. Many methods have been proposed for this measurement of human comfort by suitably designed instruments; such instruments include the Kata thermometer; the Eupatheoscope; and the Globe thermometer. These instruments can all be used to indicate a temperature such as "equivalent temperature," "effective temperature," or "resultant temperature," depending upon the apparatus used.

The second method of testing is the taking of measurements which determine directly the amount of heat which is usefully used for space heating. However, in many cases it is difficult to obtain sufficiently complete data to enable a complete balance to be obtained, since the following quantities would have to be obtained for this purpose:—(1) Heat evolved by fuel burned; (2) heat lost in ashpit by unburned fuel; (3) heat emitted by appliance as radiation; (4) heat emitted by appliance as convection; (5) heat lost by conduction through walls and floor; and (6) heat lost in flue gases, comprising sensible heat-content losses and loss due to unburned gases and smoke.

The various instruments used for measuring these quantities are numerous and new developments are taking place to obtain improved accuracy and facilitate the measurement. For example, a new type of radiometer has been evolved by the British Coal Utilisation Research Association for recording the total radiation emitted from the various types of heating appliances. Several methods are available for obtaining convection heating, but, in general, it is measured by gathering the hot air together in a single duct and measuring the rate of hot air flow, together with its rise in temperature.

Smoke emission can be measured by optical methods, and work on this subject is being continued by the B.C.U.R.A. An example of a test set up for measuring some of the quantities mentioned is seen in the accompanying illustration (Fig. 2), in which the apparatus for measuring radiation, convection heating and smoke emission can be seen. Other tests include the determination of flue gas losses, and this may be obtained by direct chemical analysis of the flue gases if not diluted with too much excess air, such as, for example, with a closed stove. Work on the direct determination of small quantities of unburned gases is also being undertaken by the B.C.U.R.A., and it is hoped to be able to obtain direct recording of unburned gas losses with even high dilution.

Future Development in Space Heating

It must be recorded that Great Britain is one of the few countries in which little account is taken in house construction to provide for efficient and effective heating systems. Some experimental buildings are now being constructed in which a certain amount of thought has been given to heating methods and suitable provision made in the house plan. It should be emphasised that improvements in solid-fuel appliances, including space heaters, are insufficient of themselves to ensure satisfactory house heating conditions. The plan of the house should take into account all services—space heating, water heating and cooking, and be designed around them instead of their being treated as an afterthought. It is only by this means that solid fuel could show to the best possible advantage and demonstrate that it can supply all the required services at the lowest possible cost.

There is no reason why, for example, a single solid-fuel fire should not supply all the heating, cooking and hot water for a small house, including the warming of the upstairs rooms. For this to become a reality, however, the design of the house and the heating system must be treated as a single problem. A solid-fuel appliance should no longer be merely placed in a hole left somewhere in the wall by the builders; it should, in fact, be installed in such a manner that it can perform all those functions of which it is capable and which give the highest degree of comfort at the lowest possible fuel cost.

DISCUSSION

MR. R. R. SHAW, of Larbert, asked what percentage of air, under normal open fire conditions passed to the fire through the ducts, also what percentage passed through the room.

In reply, MR. HALES said that the volume was roughly 2,000 cub. ft. per hr. through the ducting, and 3,000 cub. ft. through the room. This compared under

(*Continued overleaf, column* 2.)

A NOTE ON THE RUNNING OF GREY-IRON CASTINGS*

By C. TUCK

All too often very little care is taken to ensure a really clean runner to a casting. While great care is usually taken in the making and preparation of a mould, it sometimes seems that the runners and runner basins are added as afterthoughts. It should be here, however, where the greatest care is exercised, for all the metal to enter the mould has first to pass through the runner before making the finished casting. Therefore clean runners are an essential to securing a really clean casting.

Runner Basins

Quite often the runner basin to a mould is left in a very dirty condition—a state which can easily be avoided at the cost of very little time. Moreover, only too frequently it takes the form of a saucer. Again, the downgate may be seen situated centrally in the basin, thereby creating a whirlpool effect during pouring; this tends to suck down slag or dirt. In all cases care must be taken to see that there can be maintained an adequate depth of metal above the downgate. In the larger basins a flat, dried cake of sea sand or loam should be inserted at the bottom of the basin, to resist the impact of the metal.

Where the downgates connect with the runner basin is a location that is obviously subject to severe erosion, and is therefore preferably made up with a dried cake; this ensures cleanliness and provides a solid foundation for any stopper that may be used.

Downgates

During the ramming of the mould the first steps to ensure cleanliness should be taken. All downgates should be rammed solid in good clean sand, preferably facing sand. A round downgate always seems preferable to square or rectangular gates; for with the latter, on removal from the castings, "fins" can often be seen on the corners, denoting a tendency towards loose sand.

Ingates

The same care should also be exercised in relation to the ingate, the size of which should, in all cases, be slightly less than that of the downgate. This in some measure will help to prevent dirt entering the mould, by ensuring that the complete runner system is full of metal during pouring. The siting of the ingate should be chosen with some care, having regard to the mould contour. If possible the metal stream should be directed to avoid any protruding parts of either mould or cores; and the object of reaching the furthermost parts of the mould borne in mind. Very often the size and distribution of the runners is left to the discretion of the individual moulder. While no hard and fast rules can be laid down as to size,

(*Continued at foot of next column.*)

* Presented to the East Midlands branch of the Institute of British Foundrymen as an entry to a Short Paper Competition.

DESIGN AND TESTING OF SPACE HEATERS

(*Continued from previous page.*)

similar conditions with about 6,000 cub. ft. per hr. through the room to a normal open fire, but would depend on the chimney draft.

MR. T. TYRIE, B.Sc., Scottish branch-president, said that he was sorry that Mr. Hales had not dealt with radiant unit heaters. He would be very interested to learn whether the Author had any impressions of solid-fuel heaters as opposed to radiant unit heaters, either gas-fired or electrical.

MR. HALES said that unit heaters or small panel heaters had not found much application for domestic heating, although used for larger space heating, such as halls, etc. One reason for this was that they tended to direct a greater amount of radiant heat to the head, thus creating a feeling of stuffiness.

A VISITOR asked Mr. Hales why the radiometers were painted black, and was informed that this was in order to absorb the maximum amount of heat received by radiation.

MR. TYRIE asked what results had been obtained with water heating in conjunction with space heating.

MR. HALES said that this could be done quite satisfactorily and improved methods were being developed; much depended, however, on the layout of pipework and storage tank, together with proper insulation of the hot-water system.

Vote of Thanks

MR. RONALD TAYLOR, in proposing a vote of thanks to Mr. Hales, said that it was time that some consideration of thermal efficiency was given when making a purchase of a heating unit, instead of buying by appearance. He had no doubt that this was due to the feminine interest in the unit. Perhaps the mere male would have to accept the onus of selecting the appliance on performance, rather than just to fill a hole in the wall.

(*Continued from previous column.*)

and at times it is not possible to run in the most suitable place, owing to unsuitable boxes, etc., nevertheless a definite choice should be made by all concerned before moulding is commenced.

The end of the ingate connected to the mould should be slightly larger than that at the downgate end. This will avoid a concentration of the stream of metal, thus reducing the risks of "scabs or washes."

Dirt Traps

There are various methods of endeavouring to trap any dirt which may enter the runner. Most of these act on the principle that the dirt rises to the top of the molten metal. This is no doubt true if the stream is steady and smooth, but if there is any turbulence the dirt can be carried along. One notable example, common to most foundries on small work, is the spinner. Very often one sees the ingate from this cut in the same direction as the "spin" of the metal. This, of course, is wrong, and completely neutralises the spinner as a possible dirt trap.

POST-WAR EDUCATION IN THE REPETITION FOUNDRY*

BY A. SCATTERGOOD

The Government's educational reform plan stands as a milestone in the betterment of the social life of the community. The higher standard of education will increase a child's knowledge, and more important still, will increase his desire for further knowledge. Despite England's natural wealth and overseas resources, her greatest asset is her youth. Only by their physical skill and mental ability can this country hope to remain prominent in the closely contested position as the "workshop of the world."

Now that "production" is the order of the day and industrial efficiency the watchword, specialisation has been exploited to the highest degree. To the industrialist this represents the most economical and remunerative method of producing an article, but to the operator it implies dullness and monotony in industry. This is the condition obtaining in the repetition foundry, and herein lies the problem: to convince the critics that the industry offers ample scope and opportunity to the future generation.

The solution rests largely in the hands of the educational authorities and the employers. It should be the teachers' job to see that each boy is given a completely unbiassed picture of the jobs within his reach, to convey to him that a dirty face and grimy hands are not a sign of social degradation, but are symbols of his contribution to an enhanced standard of life and national prosperity. It should be the employer's duty to ensure that every boy is given an opportunity to study freely the various productive processes adopted in his particular firm.

Introduction to Industry

A boy's basic school training should be supplemented with occasional visits to local works. In this way a broader knowledge of the commercial activities in the locality would be gained. Lectures could be given by leading industrialists explaining simply and concisely the prospects and attractions in their particular field of industry. At the present time there is a strong bias in favour of joinery and carpentry—obviously an outcome of the woodwork facilities available at school. This suggests that if a boy were given the opportunity to exercise his talents in all the various crafts practised in his locality, then his own particular bent would be apparent and his career planned accordingly.

Upon first entering a foundry the young apprentice will naturally feel somewhat bewildered in his new environment, and as first impressions are so important, it is essential that these should be favourable ones. For this reason the appointment of an educational supervisor is advised. He would be responsible for the boy's educational and social activities, and it will be his job to introduce the boy to his work and to acquaint him thoroughly with the firm's production methods. In the case of small firms, this job could be incorporated with some other post—labour manager, welfare manager, or some personality capable of winning the respect of his charges and instilling them with the determination to learn and succeed.

Welfare Facilities

Once embarked upon a course of instruction, a boy's keenness and enthusiasm must not be allowed to flag through some feeling of social embarrassment or lack of interest on the part of his employers. Adequate washing and changing facilities should be provided so that the student may go straight from work to evening classes. A spirit of friendship should exist between the management and the workers of all grades and the realisation that all are pulling in the same direction instead of at opposite ends of the rope.

An annual reward made by the firm to the most promising apprentice would provide a great incentive. The student's work should be varied as much as possible. The educational supervisor could recommend a boy for a period of training in the laboratory or the rate-fixing office, whilst a short time in the coreshop or on the cupolas would prove very interesting.

Part-time Activities

The actual part-time education would, of course, consist basically of foundry practice, but in its broader aspects. As foundry work becomes more and more mechanised, foundry art will gradually disappear and foundry science will become more in evidence. This then gives an indication to the future foundry syllabus: the costing and estimating for new jobs, varying metal mixes and their suitability for different castings, shop layout and organisation. The course could touch upon the principles of mechanical engineering and stress the technical demands the two industries place upon each other. In short, from a foundry point of view, the student should be taught everything about something and something about everything.

In conclusion, though the present Education Bill will meet with hostility from some employers and employees, it is an obvious step in the right direction. Even in the last century when it was decided that every British citizen should learn to read and write, the decision was met with scorn and ridicule from many quarters. It will be the ruin of the country, they said, for no one will want to sweep the streets or scrub the floors. But the country has not been ruined and the streets and floors are still cleaned, simply because as the standard of education improved, conditions of work improved correspondingly. As the standard of education continues to improve it forms the one sure key to a fuller life for the common people.

DISCUSSION

MR. A. B. BILL said it appeared that the education and training that Mr. Scattergood sought was similar to that now given to the foundry technician. It was

* Extract from a prize-winning entry in a short Paper competition organised by the East Midlands branch of the Institute of British Foundrymen.

Post-war Education

perhaps questionable whether such training was really necessary for the operative who actually had the job of making castings. The Author suggested that mechanisation was likely to kill foundry technique entirely, and much as it may be deplored, he thought that there should be a realisation of the fact that in the repetition foundry this was true. Indeed, in personal experiences, totally unskilled labour on moulding machines had produced more and better castings than those possessing that little knowledge which could be so dangerous.

The Author also suggested that boys before leaving school should visit local works in order to decide which particular factory, or perhaps foundry, they wish to join when of age. This would be an unfortunate step, as practically every boy would choose the factory only as a last resort. Incidentally, could we not also face the fact that in the future it would be necessary to take whatever steps possible to improve working conditions in order to make the foundry as attractive as its undoubted drawbacks would allow?

Finally, Mr. Scattergood suggested that classes in foundry practice might well be introduced into school curricula and cited wood-working classes as a comparative step to produce craftsmen. He thought that classes in woodwork were not included to produce carpenters or joiners, but to develop practical expression in much the same way as our students were taught Latin and Greek to develop mental faculty.

MR. RUSSELL, referring to the point raised by Mr. Bill on the question of daytime education as distinct from evening classes, he was of opinion that boys who remained at school until they were 16 would receive a good general education. From the foundry point of view, these county colleges would not be satisfactory, as they were just going to be a continuance of the student's education, and they did not intend to give technical training in the particular industry in which the boy would pursue. He would stay at school until he was 16, go to work for four days a week, and he did not see how industry was to achieve the training it sought.

MR. F. DUNLEAVY said that with the implementation of this new Bill, by the time young men were 21 or 22 they would be finishing their training and would know no more about the foundry work than they did when they left school. In his young days, his *confrères* had four nights a week at school, as well as homework, and they were none the worse off for it. He was afraid —sincerely afraid—that unless care was exercised trouble would be experienced.

MR. H. BUNTING said the Paper made reference to boys visiting the foundry prior to entering industry; such an action would hinder rather than help recruitment. The present tendency—and there was little hope of improvement—was for the cleaner jobs. He had tried it out some years ago; the boys used to come along to the foundry with a teacher, but no result was forthcoming. As for the new education scheme, the factor which was causing concern was the possibility of the mass production of robots; were they going to teach them to think? The general set up had been for somebody else to think for them; that applied in the repetition foundry to a greater extent than it did in the ordinary foundry. Further, if they were unsuccessful in achieving the position for which they studied, they would stagnate. The older methods of training a boy made him a far better craftsman than the methods of to-day, and if that standard was not to be improved, then the whole industry would suffer.

Author's Reply

In reply to Mr. Bill, MR. SCATTERGOOD said whatever the opinions of the boys might be, works visits must be arranged in order that they realised that there were such places as foundries. Whether or not a boy decided to enter the industry depended largely upon the foundry managements and their efforts to make the industry attractive. The essential point in connection with his training was to ensure that every apprentice was given a complete picture of the ramifications of his trade. Whilst appreciating Mr. Bill's remarks on woodwork classes, the fact remained that these classes had a marked effect on a boy's ambitions as shown by the high percentage who wished to enter this trade.

Replying to Mr. Dunleavy, the AUTHOR said that if a boy's technical training in a repetition foundry was not completed at the age of 21 or 22, the fault rested with his mentors or the training scheme in vogue at the works.

Replying to Mr. Bunting, MR. SCATTERGOOD insisted that the new education scheme would teach boys to think. It could set out not so much to make a student assimilate a mass of facts, but rather for him to possess the ability to acquire knowledge, and though admittedly the older methods were adequate for the old systems of production, it must be realised that productive methods had changed and had been boosted up enormously, to such an extent that an entirely different type of operator was required with a totally different kind of training.

Vote of Thanks

Mr. A. E. Peace proposed, and Mr. T. Goodwin seconded, a vote of thanks to all the competitors. Mr. H. Pinchin replying on their behalf.

LOCATING FLAWS IN CASTINGS

Stereoscopic X-rays are being used to locate the positions of flaws in castings. By taking the exposures on separate films from slightly different angles, there appears, when they are viewed through the two lenses of a stereoscope, sufficient relief to indicate the depth of the flow. By controlling the angularity ratio of the two exposures, together with the use of a special graph, added information is given as to the actual position of the fault.

THE [AMERICAN] NON-FERROUS INGOT METAL INSTITUTE is sponsoring researches at the Battelle Memorial Institute on the influence of gases and other factors on the soundness of copper-base castings.

The High-Quality Iron for High-Duty Castings.
Made in seven standard grades or to individual requirements, this iron has a close grain structure and fine graphitic carbon content. It replaces Hematite, and tones up high phosphorus irons.
We also make Dale Refined Malleable Iron to any required specification.
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NEWS IN BRIEF

THE LATE SIR H. G. LEY, chairman of Ley's Foundries & Engineering, Limited, left £183,409.

TOOL MANUFACTURING (BERKS), LIMITED, is being wound up voluntarily. Mr. Simon Harrison is the liquidator.

THE PROHIBITION on the manufacture and supply of metal toys is removed under a new Order coming into force on July 1.

VICKERS-ARMSTRONGS, LIMITED, Walker-on-Tyne, have received an order for a 10,000-ton cargo liner for New Zealand owners.

A MASS MEETING of Tees-side iron and steel workers strongly denounced the recent ration cuts, particularly as they affect the workers in the heavy industries.

THE FOREIGN ORES DEPARTMENT of the Iron and Steel Control, Ministry of Supply, has removed from 24, Old Broad Street, E.C.2, to Steel House, Tothill Street, Westminster, S.W.1.

THE ENFIELD CABLE WORKS, LIMITED, Brimsdown, Middlesex, inform us that, for simplicity's sake, the company's name has been changed and that it will be known henceforward as "Enfield Cables, Limited."

SHAREHOLDERS of Kayser Ellison & Company, Limited, manufacturers of crucible and electric steels, are to meet on June 22 to consider the adoption of a new article of association giving the company power to appoint works and local directors.

AT A MEETING of the Tees-side Chamber of Commerce, at Middlesbrough, the chairman, Mr. A. T. S. Zealley, reported the receipt of two further inquiries for industrial sites on Tees-side, one of which he said was for the erection of a new factory.

FROM THE OUTBREAK OF WAR to the end of December last nine shipbuilding firms on the River Wear produced more than 1,500,000 tons of merchant shipping, without taking into account naval vessels of various types and large amounts of conversion and repair work.

THE MINISTER OF SUPPLY has made the Control of Shaped Diamond Tools (No. 2) (Revocation) Order, 1945, revoking the Control of Shaped Diamond Tools (No. 1) Order, 1942, which prohibited, except under licence, the production, disposal and acquisition of shaped diamond tools.

LETTERS OF RIGHT have been posted for the issue at par by Cochran & Company, Annan, Limited, engineers and boiler makers, of 50,000 £1 5 per cent. cumulative preference shares in the proportion of one for every twelve ordinary shares held on May 26 last. The shares will rank for dividend from July 1 next.

MR. P. O'HEA, chairman of the British Chamber of Commerce in Mexico, is visiting this country with the object of exchanging views and information with export trade organisations and exporting firms. Arrangements for consulting him should be made through the Federation of British Industries, 21, Tothill Street, London, S.W.1, or through the London, Manchester, or Bradford Chambers of Commerce.

NATIONAL SAFETY CONGRESS

The first National Safety Congress to be held for six years will take place in London from June 18 to 24. The annual general meeting will be held at the Institution of Civil Engineers at 5 p.m. on June 21, and will be followed by a dinner and cabaret (tickets £2) at the Savoy Hotel. At 10 a.m. next day there is to be an opening address at the Institution of Civil Engineers. At 10.20 there is a choice between two sessions—"Post-war Trends in Industrial Accident Prevention," for which a fee of 10s. is charged, or "Group Activities." At 2 p.m. there is again a choice between "The Guarding of Horizontal Milling Machines," which again carries a charge of 10s., and "Purposeful Physical Training in Industry." This function is to be held at the Conway Hall, Red Lion Square, W.C.1, and takes the form of a demonstration by the Central Council of Physical Recreation, who are issuing free tickets for this function from 58, Victoria Street.

On Saturday, June 23, there is to be discussion on "The Influence of Training in Accident Prevention" (10s.). Finally, on Sunday morning, the Congress closes with the holding of a Brains Trust, at which Sir Wilfred Garrett is to be Question Master.

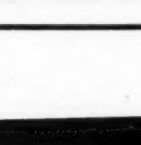
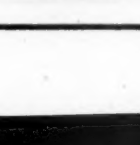
We regard this new idea of charging for participation in technical sessions an imposition which should be strongly resisted by all technicians.

DEVELOPMENTS AT SHOTTON STEELWORKS

Plans for the modernisation of the steel-making equipment at Shotton are nearly complete, and many of their schemes have already been approved, says Mr. Richard F. Summers, chairman of John Summers & Sons, Limited, in his statement to shareholders. Much of the necessary equipment has been ordered and parts of it are in an advanced stage of manufacture. Working at high pressure for the last six years, the company has produced some 3,350,000 tons of ingots. From this tonnage a vast variety of weapons and equipment has been manufactured, including incendiary bombs, Army vehicles, Bailey bridges, jettison tanks for aircraft, and Anderson and Morrison air-raid shelters. Perhaps the most outstanding contribution has been the supply of sheets sufficient to make over 60,000,000 shell and aluminium boxes, over 40,000,000 jerricans, and 16,000,000 drums for petrol and oil. These and innumerable other articles of a war-like character absorbed almost the whole of the 2,220,000 tons of sheets which the company have made.

REVOCATION OF THE CONTROL OF FOUNDRY BONDING MATERIALS

The Minister of Supply has made the Control of Foundry Bonding Materials (No. 2) (Revocation) Order, 1945, which revokes the Control of Foundry Bonding Materials (No. 1) Order, 1941, by which the disposal and acquisition of bentonite, Colbond and fullers earth, except for certain uses exempted under Direction I of the Order, were made subject to licence.

PARTING POWDERS

The progress of Mankind towards a complete civilization is possible only when all the numerous requirements therefor are forthcoming in harmonious association. It would be, for example, of little benefit to him, to have an abundance of iron ore, if he lacked the means to smelt it, or to know how to weld electrically, if the essential dynamo were not available.

Equally necessary is the continual improvement and development of his aptitudes, and of the results of their application ; he does not now smelt his iron by charcoal fire, nor propel his ships by sail.

And with increasing civilization comes an enlarging humanity, and more and more the living and the working conditions of the individual become the concern of the whole people. So there arises such a question as that which provides the title for this sketch, and more especially with that aspect of it which touches the elimination of silica from Parting Powders, while yet sacrificing none of the admitted advantages of a silica based powder.

Wm. Cumming & Co. Ltd., after extended and patient research have now produced such a material. Absolutely free of silica, this new Parting Powder, marketed as N.S.G. (Non Silica Grey) will stand up to every demand made upon it. It is quite infusible and moisture proof, parts perfectly even after hours of contact, and produces the fine smooth skin so much desired by progressive iron founders.

All parting powders are made at our Deepfields Works, thereby ensuring absolute continuity of quality and efficiency.

Wm. CUMMING & Co.

LIMITED

GLASGOW
FALKIRK
CHESTERFIELD
DEEPFIELDS
MIDDLESBROUGH

PERSONAL

MR. H. T. GARVIE has been appointed a director of the Cargo Fleet Iron Company, Limited.

BRIGADIER THOMAS ROBBINS has been appointed a director of the Rio Tinto Company, Limited.

DR. J. W. DONALDSON has been elected president of the West of Scotland Iron and Steel Institute.

MR. R. N. ALLISON has been appointed secretary of Head, Wrightson & Company, Limited, Thornaby-on-Tees.

MR. JOSEPH JONES has been appointed chief buyer of Brockhouse Castings, Limited, Wednesfield, Wolverhampton.

MR. C. E. HOLMSTROM, at present a special director of Firth-Vickers Stainless Steels, Limited, has been appointed deputy managing director.

MR. GREVILLE S. MAGINNESS (managing director of the Churchill Machine Tool Company, Limited) has joined the board of the Iron Trades Employers' Insurance Association.

SIR WILLIAM JAMES LARKE, Director of the British Iron and Steel Federation, is to have the honorary degree of Doctor of Science conferred upon him next month by Durham University.

MR. T. P. NORRIS, divisional labour manager of Imperial Chemical Industries, Limited, Billingham, is to take up an appointment as chief personnel officer to Vickers, Limited, with headquarters in London.

MR. HARRY HOPWOOD, of Cheadle, Stockport, has been appointed secretary of the reconstituted Tees-side Industrial Development Board. Mr. Hopwood was formerly on the staff of the Manchester Chamber of Commerce.

MR. R. HUGH ROBERTS, who has completed 25 years as chairman of Fisher & Ludlow, Limited, metal pressings makers, of Birmingham, has retired from the board. MAJOR E. BEDDINGTON BEHRENS has been appointed chairman.

MR. JOHN HADFIELD has been appointed to succeed the late Mr. S. D. Clements as chairman of the board of Derbyshire Stone, Limited. Mr. Hadfield has been managing director of the company since its incorporation in December, 1935.

MR. HERBERT THOMPSON GARVIE, of the British Steel Piling Company, Limited, and MR. STEPHEN N. FURNESS, chairman of the Furness Shipbuilding Company, Limited, have been elected directors of the South Durham Steel & Iron Company, Limited.

MR. J. HEDLEY JONES has been appointed to represent Hadfields, Limited, of Sheffield, in South Wales. Mr. Jones has been chief engineer at the company's Hecla Works during the war years. He will operate for the time being from 1, Prospect Street, Newport, Mon.

MR. BENJAMIN ELLIOTT, of Redcar, commercial manager of Head, Wrightson & Company's Stockton Forge works, received a presentation from the directors and staff of the company on May 30 as a mark of esteem on the occasion of his retirement after completing 50 years' service.

MR. H. D. WATT, secretary of W. H. Arnott, Young & Company, Limited, iron and machinery merchants, dismantling contractors and shipbreakers, of Glasgow, has accepted an invitation to join the board, and is now a director of the company. Mr. Watt has for a number of years been closely associated in the development of the company.

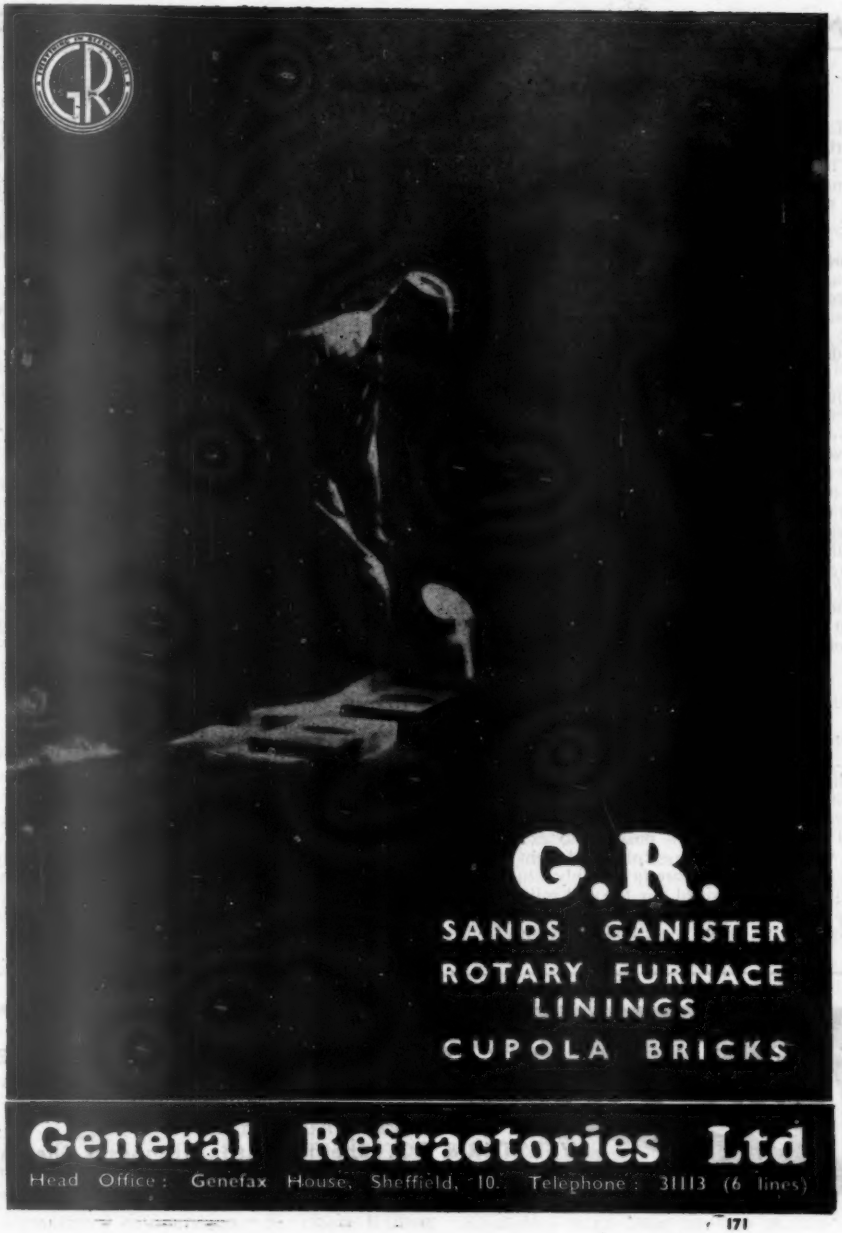
MR. J. T. ATKINSON, secretary of the Cleveland Mine Owners' Association, the North East Coast Blast Furnace Section of the Iron and Steel Trades Employers' Association, and the Tees Wharf Owners' Association, is retiring after 64 years' service. The occasion was marked by a private complimentary dinner to Mr. Atkinson at Middlesbrough on June 1. A native of Middlesbrough, Mr. Atkinson joined the Cleveland Mine Owners' Association in 1881, becoming secretary in 1911, and also secretary of the Cleveland Ironmasters' Association. Two years earlier he had become secretary of the Tees Wharf Owners' Association.

MR. J. M. OSBORNE has been appointed a director of Dorman, Long & Company, Limited. Joining the bridge department of the company in 1926, Mr. Osborne became manager of Dorman, Long's bridge-building activities five years later. In 1934 he went out to South Africa to report on the company's interests in the Union, and in January, 1935, was appointed managing director of the Union Construction Company (Pty.), Limited, in which Dorman, Long were substantially interested. A fusion effected in 1937 between the Union Construction Company and Wade & Dorman, Limited (Durban and Capetown), led to the formation of Dorman, Long (Africa), Limited, with Mr. Osborne managing director of the new company. Specialising as constructional engineers, contractors and steel merchants, Dorman, Long (Africa), Limited, made steady progress in the field of constructional engineering and public works before the war. Since 1939 the company has been responsible for heavy war production programmes. Mr. Osborne has been closely concerned with the Union's industrial war effort. Chairman in 1939 of the Industrial Council of South Africa, a joint employers' and trades union body concerned with labour matters, Mr. Osborne was re-appointed chairman in 1940 on the nomination of the trades unions. In 1942 he was appointed a member of a Government Committee reporting on war contracts. Since its inception in 1943, Mr. Osborne has been a member of the South African Board of Supply. In September of last year, he was appointed a member of the South African Supply Mission which visited the U.S.A. and Great Britain to exchange views on the supply position in the post-war transition period.

CONTRACT OPEN

Any date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Luton, June 25—Provision and laying of 2,500 yds. of 9-in. dia. spun-iron water mains, for the Rural District Council. Mr. J. A. Murch, engineer and surveyor, 73, West Parade, Dunstable, Beds. (Fee £2 2s., returnable.)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Raw Material Markets

IRON AND STEEL

Even for the present limited needs of the home industries the current output of pig-iron is barely sufficient. The steel furnaces are adequately supplied, but foundrymen complain that their licences are frequently cut, and neither at the ironworks nor at the foundries are there more than slender stocks of high-phosphorus iron. It is understood that another blast furnace will shortly be lighted up on the North-East Coast, but the output is required for steel-making and the position in regard to foundry pig remains tight. Other grades, such as low-phosphorus and refined irons, are more readily obtainable, but a very slight expansion in demand would quickly absorb the available surplus.

The foundry labour problem is still acute and has shown little sign so far of becoming less so, though there is hope that the position will show some measure of improvement before long. As it is, most foundries, including those associated with engineering works, are working pretty well to the full extent of the labour that is available.

Formerly reliant upon substantial imports of foreign steel for the nourishment of the re-rolling industry, the British steel trade has now reached a state of self-sufficiency. Here again, however, the margin between supply and demand is precarious and a shortage has only been avoided by the extensive use of defectives, crops, shell discards, etc. The pressure for sheet bars is intense and, as light sheets figure conspicuously in the list of military requisitions, some of the works have switched over from billets to sheet bars. In consequence, some of the smaller sizes of billets are in short supply. Wire rods and billets are also eagerly sought by the wire mills.

There has been a slight quickening in the flow of specifications for steel plates and sections, but the tonnages required at the shipyards are well below peak levels and the mills are in a position to execute new orders at very short notice. Rollers of light sections and small bars are much more favourably situated and full employment is provided for the rail mills. There is also a swollen demand for rolling stock, which has given some impetus to the plate and heavy sheet mills.

NON-FERROUS METALS

The Minister of Supply has made the Control of Non-Ferrous Metals (No. 17) (Copper, Lead, and Zinc) Order, 1945, which came into force on June 11. The new Order increases the maximum prices for lead by £5 a ton, for zinc, zinc sheets and rolled zinc (boiler plates) by £5 10s. a ton, and for zinc oxides by £4 15s. a ton. This is the first increase in the prices of unwrought lead and zinc since December, 1939. The Order also abolishes the maximum prices for hard spelter, zinc dross, flux skimmings and certain descriptions of copper scrap, brass scrap and swarf, and gunmetal scrap and swarf. The new Order does not affect any change of importance in regard to the licensing of the acquisition or disposal of non-ferrous material concerned, but it provides for the exemption from the operation of the maximum price provisions scheduled materials which are delivered or intended to be delivered outside the United Kingdom or on board ship for export outside the United Kingdom.

The new maximum prices (delivered buyers' premises unless otherwise indicated) are as follow:—

Good soft pig lead (foreign), £30 (duty paid); good soft pig lead (Empire and domestic, including secondary or remelted lead), £30; lead of the quality known as "English," £31 10s.

G.O.B. zinc (foreign), £31 5s. (duty paid); G.O.B. zinc (domestic, including secondary and resmelted zinc), £32; "Prime Western" and debased zinc, £32; refined and electrolytic zinc, £32 15s.; zinc of not less than 99.99 per cent. purity, £34 5s.; zinc sheets (No. 10 gauge and thicker, in lots of 5 tons or more), £43 2s. 6d., ex works; rolled zinc (boiler plates), £41 2s. 6d., ex works.

Zinc oxide: Red seal, £36 5s.; green seal, £37 15s.; white seal, £38 15s., delivered buyers' premises in lots of not less than 2 tons.

Holders of valid licences to purchase lead and zinc metal (as sold by the Control) granted on or before June 10, 1945, may, on application to the Joint Controllers, Non-Ferrous Metals Control, Grand Hotel, Rugby, cover themselves by purchases, where they have not already done so, against such licences up to and including June 24, at the maximum prices ruling on June 10, 1945.

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